

Claims

What is claimed is:

1. An air-treatment system, comprising:  
a cooling circuit;  
a first heat exchanger in thermal communication with the cooling circuit;  
a secondary circuit in thermal communication with the first heat exchanger; and  
a controller in communication with at least one of the cooling circuit, the first heat exchanger, and the secondary circuit, the controller operable to receive at least one input indicative of a desired ambient condition, a current ambient condition, and of at least one of a cooling circuit operation and a secondary circuit operation, and operable to change the operation of at least one of the cooling circuit and the secondary circuit when the current ambient condition is outside of a desired ambient condition range.
2. The air-treatment system of claim 1, wherein the cooling circuit includes:  
a compressor;  
a condenser in fluid communication with the compressor; and  
an expansion valve in fluid communication with the condenser.
3. The air-treatment system of claim 2, further including:  
a second expansion valve in fluid communication with the condenser; and  
a second heat exchanger in fluid communication with the second expansion valve and the compressor.

4. The air-treatment system of claim 1, wherein the secondary circuit includes:
  - at least one pump;
  - at least one heat exchanger in fluid communication with the pump;and
  - at least one fan proximally disposed relative to the at least one heat exchanger, the fan operable to cause a flow of air across the at least one heat exchanger.
5. The air-treatment system of claim 4, further including a heating device proximally disposed relative to the at least one heat exchanger and fan, wherein the airflow from the fan is first directed across the at least one heat exchanger and subsequently the heating device.
6. The air-treatment system of claim 1, wherein the input indicative of desired ambient condition includes at least one of a temperature, a treatment mode, and a fan speed.
7. The air-treatment system of claim 4, wherein the desired treatment mode includes at least one of a cooling mode, a defrost mode, and a ventilation mode.
8. The air-treatment system of claim 1, wherein the input indicative of the current ambient condition includes at least one of an air temperature, a fan speed, and a solar load.
9. The air temperature treatment system of claim 1, wherein the input indicative of current air-treatment system operation includes at least one of a compressor discharge temperature, a fan speed, a condenser outlet temperature, a heat exchanger temperature, an air temperature, and a water valve position.
10. An air-treatment system, comprising:

- a cooling circuit;
- a first heat exchanger in thermal communication with the cooling circuit;
- a secondary circuit in thermal communication with the first heat exchanger; and
- at least one heating circuit in fluid communication with the secondary circuit.

11. The air-treatment system of claim 10, wherein the cooling circuit includes:

- a compressor;
- a condenser in fluid communication with the compressor; and
- an expansion valve in fluid communication with the condenser.

12. The air-treatment system of claim 11, further including:

- a second expansion valve in fluid communication with the condenser; and
- a second heat exchanger in fluid communication with the second expansion valve and the compressor.

13. The air-treatment system of claim 10, wherein the secondary circuit includes:

- at least one pump;
- at least one heat exchanger in fluid communication with the pump;
- and
- at least one fan proximally disposed relative to the at least one heat exchanger, the fan operable to cause a flow of air across the at least one heat exchanger.

14. The air-treatment system of claim 13, wherein the at least one heating circuit includes:

at least one heating device;

a first water valve disposed between the first heat exchanger and the at least one pump, the first water valve operable to allow a flow of fluid from the at least one heating device to the at least one pump; and

a second water valve disposed between the at least one heat exchanger and the first heat exchanger, the second water valve operable to allow a flow of fluid from the at least one heat exchanger to the at least one heating device.

15. The air-treatment system of claim 14, wherein the at least one heating device is fuel-fired.

16. The air-treatment system of claim 15, wherein the at least one heating device is electrically powered.

17. The air-treatment system of claim 14, wherein the at least one heating device is an engine.

18. The air-treatment system of claim 14, further including a second heating circuit connected to the first and second water valves, the second heating circuit having at least one heating device in fluid communication with the first and second water valves to allow a flow of fluid from the at least one heat exchanger of the secondary circuit into the second heating circuit and a flow of fluid from the second heating circuit to the at least one pump of the secondary circuit.

19. The air-treatment system of claim 18, wherein the at least one heating device of the second heating circuit is an engine.

20. The air-treatment system of claim 19, wherein the fluid from the first heating circuit is selectively allowed to flow through the second heating circuit to warm the engine.

21. The air-treatment system of claim 14, further including a controller in communication with at least one of the cooling circuit, the first heat exchanger, the secondary circuit, and the at least one heating circuit, the controller operable to receive at least one input indicative of a desired ambient condition, a current ambient condition, of at least one of a cooling circuit operation, a secondary circuit operation, and the at least one heating circuit operation, and operable to change the operation of at least one of the cooling circuit, the secondary circuit, and the at least one heating circuit when the current ambient condition is outside of a desired ambient condition range.

22. The air-treatment system of claim 21, wherein the input indicative of a desired ambient condition includes at least one of a temperature, a mode, and a fan speed.

23. The air temperature system of claim 21, wherein the mode includes at least one of a cooling mode, a heating mode, a defrost mode, and a ventilation mode.

24. The air-treatment system of claim 21, wherein the input indicative of the current ambient condition includes at least one of an air temperature, a fan speed, and a solar load.

25. The air temperature treatment system of claim 21, wherein the input indicative of current air-treatment system operation includes at least one of a compressor discharge temperature, a fan speed, a condenser outlet temperature, a heat exchanger temperature, an air duct temperature, a heating device outlet temperature, a heating device inlet temperature, and a water valve position.

26. A work machine, comprising:  
an operator cabin; and  
an air-treatment system including:  
a cooling circuit;

a first heat exchanger in thermal communication with the cooling circuit;

a secondary circuit in thermal communication with the heat exchanger; and

a controller in communication with at least one of the cooling circuit, the first heat exchanger, and the secondary circuit, the controller operable to receive at least one input indicative of a desired ambient condition of the operator cabin, a current ambient condition of the operator cabin, and of at least one of a cooling circuit operation and a secondary circuit operation, and operable to change the operation of at least one of the cooling circuit and the secondary circuit when the current ambient condition of the operator cabin is outside of a desired ambient condition range.

27. The work machine of claim 26, further including:

a sleeping cabin, wherein the controller is operable to receive input indicative of a desired ambient condition of the sleeping cabin, operable to receive input indicative of a current ambient condition of the sleeping cabin, and operable to change the operation of at least one of the cooling circuit and the secondary circuit when the current ambient condition of the sleeping cabin is outside of a desired ambient condition range.

28. The work machine of claim 26, further including at least one heating circuit in fluid communication with the secondary circuit.

29. The work machine of claim 28, further including a second heating circuit connected to the at least one heat circuit, the second heating circuit having an engine and the fluid from the first heating circuit being selectively allowed to flow through the second heating circuit to impart heat to the engine.

30. A method of treating ambient air in a work machine, comprising:

operating a cooling circuit to cool a refrigerant;  
operating a secondary circuit to selectively transfer heat from at least one of an operator cabin and a sleeping cabin of the work machine to the cooled refrigerant;  
receiving input indicative of a desired ambient condition;  
receiving input indicative of a current ambient condition;  
receiving input indicative of at least one of a cooling circuit operation and a secondary circuit operation;  
changing at least one of the cooling circuit operation and the secondary circuit operation when the desired ambient condition is outside of a desired ambient condition range.

31. The method of claim 30, further including operating a heating circuit in fluid communication with the secondary circuit to selectively transfer heat to at least one of the operator cabin and the sleeping cabin.

32. The method of claim 31 further including operating a second heating circuit in fluid communication with the heating circuit and the secondary circuit to selectively transfer heat to at least one of an operator cabin and a sleeping cabin.

33. The method of claim 32, further including allowing a flow of heated fluid from the heating circuit to the second heating circuit to heat an engine.

34. The method of claim 30, further including heating the flow of air after removing humidity with the cooled fluid in the secondary circuit and then directing the flow of air to the operator cabin.